## Technical Publications by Bell System Authors Other Than in The Bell System Technical Journal

*Generalizations of the Weiss Molecular Field Theory of Antiferromagnetism.** P. W. ANDERSON.[1] *Phys. Rev.*, v. 79, pp. 705–710, Aug. 15, 1950.

ABSTRACT—A Weiss field calculation has been carried out for antiferromagnetism in more complicated structures than the usual calculation allows and has been shown to give results more detailed and more consistent with experimental evidence on the magnetic properties of such structures than does the simpler theory.

*Atomic Moments of Ferromagnetic Alloys.* R. M. BOZORTH.[1] Letter to the editor. References. *Phys. Rev.*, v. 79, p. 887, Sept. 1, 1950.

*Domain Structure of a Cobalt-Nickel Crystal.* R. M. BOZORTH[1] and J. G. WALKER.[1] Letter to the editor. *Phys. Rev.*, v. 79, p. 888, Sept. 1, 1950.

*Recording Fluxmeter of High Accuracy and Sensitivity.** P. P. CIOFFI.[1] *Rev. Sci. Instruments*, v. 21, pp. 624–628, July 1950.

ABSTRACT—A recording fluxmeter has been developed which employs one or two integrators and a double element L and N Speedomax recorder for tracing magnetization curves directly on standard coordinate paper. The response of the recorder pen drive mechanism is proportional to the flux density, B, and is controlled by the B integrator. The response of the paper drive mechanism is proportional to the magnetizing force, H, and is controlled either by the magnetizing current, when the specimen is in the form of a ring, or by the H integrator when the specimen is in the form of a bar. Ayrton shunt networks provide flexible B and H scale adjustments. High accuracy and sensitivity are obtained by minimizing the causes of drift. At maximum sensitivity, four interlinkages give a deflection of one mm.

*Young's Modulus and Its Temperature Dependence in 36 to 52 pct Nickel-Iron Alloys.** M. E. FINE[1] and W. C. ELLIS.[1] *Jl. Metals*, v. 188, pp. 1120–1125, Sept. 1950.

ABSTRACT—Young's modulus and its temperature coefficient in 36 to 52 pct Ni-Fe alloys depend upon composition and also the straining-annealing history. Alloys near 42.5 pct Ni, when worked cold and then annealed at 400° or 600°C, have nearly zero mean thermoelastic coefficients between −50° and 100°C. A discussion of the theory is given.

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*Ultra-High Vacuum Ionization Manometer.* J. J. LANDER.[1] *Rev. Sci. Instruments*, v. 21, pp. 672–673, July 1950.

ABSTRACT—This note describes an ionization menometer which indicates pressures more than two decades below the lower limit usually encountered at about $1 \times 10^{-8}$ mm of Hg with other manometers. This limit depends on the design of the gauge; however, values reported for various gauges do not differ much from that given above. Commonly the limit is observed as a lowest reading obtained despite recourse to more or less drastic metbods of producing lower pressures, or a variety of changes in gauge design. The flash filament method of pressure measurement has been used to measure lower pressures and at the same time to indicate tbe lower limit of an ionization guage.

*Metallized Paper for Capacitors.** D. A. MCLEAN.[1] *I.R.E., Proc.*, v. 38, pp. 1010–1014, Sept., 1950.

ABSTRACT—Metallized capacitor paper is attracting widespread interest as a way of reducing capacitor size. In metallized paper capacitors, the usual metal foil is replaced by a thin layer of metal evaporated onto the surface of the paper. Lacquering the paper prior to metallizing increases the dielectric strength and insulation resistance, reduces atmospheric corrosion of the metal, and diminishes the rate of loss of electrode metal by electrolysis. Owing to the extreme thinness of the metal layer, metallized paper capacitors are subject to a type of failure not ordinarily found in conventional capacitors. This type of failure consists of the loss of electrode by electrolysis and occurs under d-c. potential when the ionic conductivity is high, as results, for example, from the presence of moisture. For this reason, it is recommended that special precautions be taken to keep the ionic conductivity low, in particular with respect to thorough and effective drying and sealing of the capacitor units.

*Thermoelastic Stress Around a Cylindrical Inclusion of Elliptic Cross Section.* R. D. MINDLIN[1] and H. L. COOPER.[1] *Jl. Applied Mech.*, v. 17, pp. 265–268, Sept. 1950.

ABSTRACT—The two-dimensional equations of thermoelasticity are solved for the case of a uniform temperature change of an infinite medium containing a cylindrical inclusion of elliptic cross section. The problem is treated as one of plane strain in elliptic co-ordinates, and the solution is given in closed form. Formulas and curves are given for the maximum values of various components of stress at the interface between the inclusion and the surrounding medium.

*Magnetostriction of Permanent Magnet Alloys.** E. A. NESBITT.[1] Bibliography. *Jl. Applied Phys.*, v. 21, pp. 879–889, Sept. 1950.

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ABSTRACT—In order to obtain a better understanding of the mecbanism of coercive force in modern permanent magnets, magnetostriction measurements have been made on various alloys having coercive forces from 50 to 600 oersteds. The results can be summarized by discussing two types of alloys. First are the older carbon-bardening permanent magnets, and for these alloys bigh coercive force and high magnetostriction occur together. Second are the new carbon-free permanent magnets and for tbese alloys high coercive force does not occur with high magnetostriction. In fact for the Mishima alloys having compositions near 29 per cent nickel, 12.5 per cent aluminum, and 58.5 per cent iron, cooled at tbe rate of 3°C per second (coercive force 400 oersteds), tbe magnetostriction actually passes through zero. This is contrary to the classical strain tbeory of coercive force which states that the latter is proportional to the product of tbe magnetostriction and internal stress. To explain the mechanism of coercive force for these alloys it is necessary to resort to more recent theories.

*Stress Analysis for Compressible Viscoelastic Materials.** W. T. READ, JR.[1] *Jl. Applied Phys.*, v. 21, pp. 671–674, July 1950.

ABSTRACT—Mathematical methods of stress analysis are presented for linear, compressible, viscoelastic, or anelastic, materials such as metals at high temperatures or high polymers with small strains. For such materials stress, strain and their time derivatives of all orders are related by linear equations with coefficients which are material constants. Fourier integral methods are used to show that static elasticity solutions can be used to determine the time dependent stresses in viscoelastic bodies with any form of boundary conditions.

If stress and double refraction and their time derivatives are also linearly related, the standard photoelastic techniques can be used to determine the directions and difference in magnitude of tbe time dependent principal stresses, even though the principal stress axes do not coincide with the polarizing axes and both vary with time. When viscoelastic models are used in photoelastic studies, the time variation of the stress distribution in tbe model represents a first approximation to the dependence of the stress in the elastic prototype on Poisson's ratio.

*Metallurgy Behind the Decimal Point.** E. E. SCHUMACHER.[1] *Jl. Metals*, v. 188, pp. 1097–1110, Sept. 1950.

ABSTRACTS—No one property has a monopoly as to being disproportionately affected by minor elements. Nearly all properties are affected, but there is time here to include only a selected few. I have chosen, tberefore, three of general interest: strength, magnetic, and electrical properties. I shall inquire into both the mechanisms and consequences of these dispro-

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portionate effects and try to share with you the fascination and challenge of this field.

*Chain Feed Carries Springs Through Forming Die.* J. D. THOMPSON[2] and G. W. RADA.[2] *Am. Mach.*, v. 94, pp. 86–87, Oct. 2, 1950.

*Punch-Press Tooling Works from Cams, Makes Cams.* J. H. TOMLIN.[2] *Am. Mach.*, v. 94, pp. 106–108, Sept. 18, 1950.

ABSTRACT—Literally millions of cam-shape combinations are possible in the telephone-exchange contact cams made for Bell Telephone; yet only two punches and two dies do all the work . . . Two cams are cut at a time from same-size master cams in a punch-press setup that allows a switch to a new cam shape in a matter of seconds.

*Construction of Cold-Cathode Counting or Stepping Tubes.** M. A. TOWNSEND.[1] *Elec. Engg.*, v. 69, pp. 810–813, Sept. 1950.

ABSTRACT—Electronic digital counters are capable of performing at high speeds many of the functions which are performed at low speeds by chains of relays and mechanical stepping switches. Here is described a new principle of tube construction by means of which the position of a glow discharge can be made to step along a row of cold cathodes under the control of input pulses.

*Ferromagnetic Domains.** H. J. WILLIAMS.[1] References. *Elec. Engg.*, v. 69, pp. 817–822, Sept., 1950.

ABSTRACT—Ferromagnetism is based on the property of domains. These are tiny regions within a magnetic substance. They have this special characteristic: most of the elementary atomic magnets contained in a particular domain have their spins oriented in the same direction. Domain sizes and shapes are the result of an attempt of the ferromagnetic system to reach a state that minimizes the magnetostatic, magnetostrictive, domain-boundary, and other energies.

*416A-Tube for Microwave Relays.* K. P. DOWELL.[2] *FM*, v. 10, pp. 20–22, Aug., 1950.

ABSTRACT—For construction of its cross-country microwave relay chain, the Bell System required a 4,000-mc. amplifier tube having a greater gain-bandwidth product than any available at the time. The 416A planar triode, shown in Fig. 1, was developed especially for this application. Because of its exceptionally close interelectrode spacing, new techniques were necessary for factory production of the tube. It is the purpose of this paper to show some of the unique operations employed in its manufacture and assembly.

*On the Acoustics of Coupled Rooms.** C. M. HARRIS[1] and H. FESHBACH. *Acoustical Soc. Am., Jl.*, v. 22, pp. 572–578, Sept. 1950.

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ABSTRACT—In many acoustically coupled systems the methods of geometrical acoustics do not apply. Reverberation formulas as ordinarily used would lead to incorrect results. This paper approaches the problem of coupled rooms from the "wave" point of view, treating the coupled rooms as a boundary value problem in obtaining an approximate solution. The results explain some discrepancies noted by earlier researchers between experiment and predictions from geometrical acoustics; for example, the dependence of absorption in a room on the position of the open area which couples the room to an adjacent one. For the case where the window area which couples one room to another is comparable in size with the partition which separates the rooms, the effect of the partition will be least when it is at a particle-velocity node. For the case where the window area is small compared with the partition which separates the two rooms, the effect of the coupling window depends on the square of the unperturbed pressure at the window. Thus the effect of the window varies with position and is least at a pressure node. Experimental data on isolated modes of vibration of a coupled system are given which check the results predicted by this application of the wave theory.

*Quantitative Spectrochemical Analysis of Ashes, Deposits, Liquids, and Miscellaneous Samples.** E. K. JAYCOX.[1] References. *Anal. Chem.*, v. 22, pp. 1115–1118, Sept. 1950.

ABSTRACT—A general technique is described which is applicable to the quantitative spectrochemical analysis of a wide variety of materials. Sample preparation, the incorporation of spectrochemical buffers, and excitation procedures are discussed for typical cases which illustrate the scope and possibilities of the method. Examples include the analysis of the ashes of rubber, plastics, paper, and cloth; deposits on walls of vacuum tubes and other surfaces; water, oils, and other liquids; and miscellaneous solid materials.

*Response Peaks in Finite Horns.** C. T. MOLLOY.[1] *Acoustical Soc. Am., Jl.*, v. 22, pp. 551–557, Sept. 1950.

ABSTRACT—It is the purpose of this paper to discuss the theory of the axial response curves of the class of acoustical systems comprising a driving unit and a finite "Hyperbolic Horn". The term "Hyperbolic Horn" as used in this paper denotes horns of the type first discussed by Salmon. It is proposed to derive an expression from which the response curve may be calculated. A method will also be given by means of which the peaks in this response curve may be located without the necessity of computing the whole curve. Finally the converse problem will be discussed, namely, how to

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choose the driving unit and horn parameters so that one of the response peaks will occur at a predetermined frequency.

*Hard Rubber.* H. PETERS.[1] Bibliography. *Ind. & Engg. Chem.*, v. 42, pp. 2007–2019, Oct. 1950.

ABSTRACT—The chemical engineer who picks hard rubber for various special uses usually does so on the basis of its availability, its relatively reasonable cost, its good physical and chemical properties, its ease of machining and fabrication, and its excellent resistance to a great variety of chemicals. This annual review of 1949, like the previous one in 1948 (32), deals with the above in addition to some fundamental studies on natural and synthetic hard rubbers. Heretofore, these basic investigations were usually centered around hard rubber prepared from natural rubber; now there is a decided interest in hard rubber prepared from the synthetics. While admittedly this interest is at a very low ebb, the trend is definitely upward and probably will continue that way for years to come.

*Holes and Electrons.** W. SHOCKLEY.[1] *Physics Today*, v. 3, pp. 16–24, Oct. 1950.

ABSTRACT—Some new experiments in transistor electronics are described here in which concepts suggested by theory have been verified directly by experiment.

*Metallized Paper Capacitors.** J. R. WEEKS.[1] *I.R.E., Proc.*, v. 38, pp. 1015–1018, Sept., 1950.

ABSTRACT—Metallized paper capacitors are being introduced into telephone apparatus wherever size is of prime importance. It is shown that low-voltage metallized paper capacitors with about half the volume of a foil-paper capacitor of conventional design have about the same characteristics as the latter. Performance data are discussed which indicate that such capacitors will give long service when used within their voltage rating and when well-protected against moisture. It is pointed out that this type of capacitor should be used within its voltage rating if sparking with its attendant circuit noise is to be avoided. When sparking does occur due to abnormal voltage conditions no permanent damage results.

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